

## CLAIMS

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- 1 1. A system for filtering input data comprising:  
2 a filtering database for storing at least one rule table, said rule table comprising a data  
3 element locator and a default rule; and  
4 a data filtering engine coupled to the filtering database for filtering said input data using  
5 the at least one rule table in the filtering database.
  - 1 2. The system for filtering input data in claim 1 wherein the filtering database comprises  
2 layered tables of rule tables.
  - 1 3. The system for filtering input data in claim 1 wherein the default rule comprises a  
2 statistics counter.
  - 1 4. The system for filtering input data in claim 1 wherein the at least one rule table further  
2 comprises at least one filtering rule.
  - 1 5. The system for filtering input data in claim 4 wherein the at least one filtering rule  
2 comprises a statistics counter.
  - 1 6. The system for filtering input data in claim 1 wherein the data element locator comprises  
2 an offset and a mask for selecting a data element of the input data.
  - 1 7. The system for filtering input data in claim 1 wherein the data element locator further  
2 comprises a table timer.
  - 1 8. The system for filtering input data in claim 1 wherein the data filtering engine further  
2 comprises:

3 a data buffer for storing the input data;  
4 a data element locator buffer for storing the data element locator; and  
5 a rule evaluator for receiving the input data from the data buffer and applying the at least  
6 one rule table to the input data.

1 9. A system for filtering input data comprising:

2 a filtering database comprising layered rule tables, each rule table comprising a data  
3 element locator and a default rule; and

4 a data filtering engine coupled to the filtering database for filtering said input data using  
5 the layered rule tables in the filtering database.

1 10. The system for filtering input data in claim 9 wherein each rule table further comprises at  
2 least one filtering rule.

1 11. The system for filtering input data in claim 10 wherein the at least one filtering rule  
2 comprises a statistics counter.

1 12. The system for filtering input data in claim 9 wherein the data element locator comprises  
2 an offset and a mask for selecting a data element of the input data.

1 13. The system for filtering input data in claim 9 wherein the data filtering engine further  
2 comprises:

3 a data buffer for storing the input data;

4 a data element locator buffer for storing the data element locator; and

5 a rule evaluator for receiving the input data from the data buffer and applying at least one  
6 rule table to the input data.

1 14. The system for filtering input data in claim 13 wherein the rule evaluator uses the data  
2 element locator to select a data element from the input data.

1 15. A system for filtering input data comprising:  
2 a data buffer for storing the input data;  
3 a data element locator for indicating a data element in the input data;  
4 at least one rule table for storing the data element locator and at least one rule to be  
5 applied to the data element in the input data; and  
6 a rule evaluator having a first input coupled to the data buffer for using the data element  
7 locator to determine the data element from the input data and for applying the at least one rule  
8 table to the data element.

1 16. The system for filtering input data in claim 15 wherein the at least one rule table  
2 comprises at least one filtering rule and at least one default rule to be applied to the data element  
3 indicated by the data element locator.

1 17. The system for filtering input data in claim 16 wherein the at least one filtering rule and  
2 the at least one default rule comprise a statistics counter.

1 18. The system for filtering input data in claim 15 further comprising:  
2 a filtering database for storing the at least one rule table as layered tables of rules.

1 19. A system for filtering input data comprising:

2 a data buffer for storing the input data;  
3 a data element locator for indicating a data element in the input data;  
4 a filtering database comprising layered tables of rules, each rule table comprising the data  
5 element locator and at least one rule to be applied to the data element in the input data; and  
6 a rule evaluator having a first input coupled to the data buffer for using the data element  
7 locator to determine the data element from the input data and for applying the at least one rule  
8 table to the data element.

1 20. The system for filtering input data in claim 19 wherein each rule table comprises at least  
2 one filtering rule and at least one default rule to be applied to the data element indicated by the  
3 data element locator.

1 21. A method for filtering input data comprising at least one data element in a system  
2 comprising a filtering database, wherein the filtering database comprises at least one rule table,  
3 said at least one rule table comprising a data element locator and a default rule, the method  
4 comprising the steps of:

5 selecting the data element from the input data;  
6 comparing the selected data element to an upper bound of the filtering rule; and  
7 comparing the selected data element to a lower bound of the filtering rule.

1 22. The method of claim 21 wherein the step of selecting the data element further comprises  
2 the substeps of:

3 obtaining the data element locator from the rule table in the filtering database; and

4 applying the data element locator to the input data to select the data element from the  
5 input data.

1 23. The method of claim 21 wherein the step of comparing the selected data element to an  
2 upper bound of the filtering rule comprises the substep of:

3 determining whether the selected data element is less than or equal to the upper bound.

1 24. The method of claim 21 wherein the step of comparing the selected data element to a  
2 lower bound of the filtering rule comprises the substep of:

3 determining whether the selected data element is greater than or equal to the lower bound.

1 25. A method for filtering input data in a system comprising a filtering database containing  
2 layered tables of rule tables, the method comprising the steps of:

3 selecting a data element from the input data;

4 accessing a rule table in said layered tables of rule tables corresponding to the selected  
5 data element; said rule table comprising at least one filtering rule; and

6 applying the at least one filtering rule to the selected data element.

1 26. The method of claim 25 wherein the step of selecting a data element further comprises  
2 the substeps of:

3 obtaining a data element locator from the rule table in the filtering database; and

4 applying the data element locator to the input data to select the data element from the  
5 input data.

1 27. The method of claim 25 wherein the step of applying the at least one filtering rule  
 2 comprises the substep of:

3 determining whether the selected data element is less than or equal to an upper bound.

1 28. The method of claim 25 wherein the step of applying the at least one filtering rule  
 2 comprises the substep of:

3 determining whether the selected data element is greater than or equal to a lower bound.

1 29. A system for filtering packets comprising:

2 a filtering database for storing at least one rule table, said at least one rule table

3 comprising a protocol element locator and a default rule; and

4 a packet filtering engine coupled to the filtering database for filtering said packets using  
 5 the at least one rule table in the filtering database.

1 30. The system for filtering packets in claim 29 wherein the filtering database comprises  
 2 layered tables of rule tables.

1 31. The system for filtering packets in claim 29 wherein the at least one rule table further  
 2 comprises at least one filtering rule.

1 32. The system for filtering packets in claim 31 wherein the at least one filtering rule  
 2 comprises a statistics counter.

1 33. The system for filtering packets in claim 29 wherein the protocol element locator  
 2 comprises an offset and a mask for selecting a protocol element of the packet.

1 34. The system for filtering packets in claim 29 wherein the protocol element locator further  
2 comprises a table timer and statistics counters.

1 35. The system for filtering packets in claim 29 wherein the packet filtering engine further  
2 comprises:

3 a packet buffer for storing packet;

4 a protocol element locator buffer for storing the protocol element locator; and

5 a rule evaluator for receiving the packet from the packet buffer and applying the at least  
6 one rule table to the packet.

1 36. The system of claim 29 wherein the packet filtering engine is coupled to receive a packet  
2 prototype modifying the filtering database.

1 37. A system for filtering packets comprising:

2 a filtering database comprising a plurality of layered rule tables, each rule table  
3 comprising a protocol element locator and a default rule; and

4 a packet filtering engine coupled to the filtering database for filtering said packets using  
5 the layered rule tables in the filtering database,

6 wherein the system is coupled to receive a packet prototype for determining a location to  
7 be modified in the filtering database.

1 38. The system for filtering packets in claim 37 wherein each rule table further comprises at  
2 least one filtering rule.

1 39. The system for filtering packets in claim 37 wherein the at least one filtering rule  
2 comprises a statistics counter.

1 40. The system for filtering packets in claim 37 wherein the protocol element locator  
2 comprises an offset and a mask for selecting a protocol element from the packet.

1 41. The system for filtering packets in claim 37 wherein the packet filtering engine further  
2 comprises:

3 a packet buffer for storing packets;

4 a protocol element locator buffer for storing the protocol element locator; and

5 a rule evaluator for receiving the packet from the packet buffer and applying at least one  
6 rule table to the packet.

1 42. The system for filtering packets in claim 37 wherein the rule evaluator uses the protocol  
2 element locator to select a protocol element from the packet.

1 43. A system for filtering packets comprising:

2 a packet buffer for storing the packets;

3 a protocol element locator for indicating a protocol element in the packet;

4 at least one rule table for storing the protocol element locator and at least one filtering  
5 rule to be applied to the protocol element in the packet; and

6 a rule evaluator having a first input coupled to the packet buffer for using the protocol  
7 element locator to determine the protocol element from the packet and for applying the at least  
8 one rule table to the protocol element.



1 44. The system for filtering packets in claim 43 wherein the at least one rule table comprises  
2 at least one filtering rule and at least one default rule to be applied to the protocol element  
3 indicated by the protocol element locator.

1 45. The system for filtering packets in claim 43 further comprising:  
2 a filtering database for storing a decision tree as layered tables of rules.

1 46. The system for filtering packets in claim 43 further comprising a processor interface,  
2 wherein the processor interface is coupled to receive a packet prototype for determining a  
3 location in the filtering database.

1 47. A system for filtering packets comprising:  
2 a packet buffer for storing packets;  
3 a protocol element locator for indicating a protocol element in the packet;  
4 a filtering database comprising layered tables of rules, each rule table comprising the  
5 protocol element locator and at least one rule to be applied to the protocol element in the packet;  
6 and  
7 a rule evaluator having a first input coupled to the packet buffer for using the protocol  
8 element locator to determine the protocol element from the packet and for applying the at least  
9 one rule table to the protocol element.

1 48. The system for filtering packets in claim 47 wherein each rule table comprises at least  
2 one filtering rule and at least one default rule to be applied to the protocol element indicated by  
3 the protocol element locator.

1 49. The system for filtering packets in claim 47 further comprising a processor interface for  
2 receiving a packet prototype, said packet prototype to be used in modifying the filtering database.

1 50. A method for filtering packets, each packet comprising at least one protocol element, in a  
2 system comprising a filtering database, wherein the filtering database comprises at least one rule  
3 table, said at least one rule table comprising a protocol element locator and a filtering rule, the  
4 method comprising the steps of:

5 selecting the protocol element from the input data;

6 comparing the selected protocol element to an upper bound of the filtering rule; and

7 comparing the selected protocol element to a lower bound of the filtering rule.

1 51. The method of claim 50 wherein the step of selecting the protocol element further  
2 comprises the substeps of:

3 obtaining the protocol element locator from the rule table in the filtering database; and

4 applying the protocol element locator to the packet to select the protocol element from the  
5 packet.

1 52. The method of claim 50 wherein the step of comparing the selected protocol element to  
2 the upper bound of the filtering rule comprises the substep of:

3 determining whether the selected protocol element is less than or equal to the upper  
4 bound.

1 53. The method of claim 50 wherein the step of comparing the selected protocol element to  
2 the lower bound of the filtering rule comprises the substep of:

determining whether the selected protocol element is greater than or equal to the lower bound.

54. The method of claim 50 further comprising the step of receiving a packet prototype for modifying the filtering database.

55. A method for filtering packets in a system comprising a filtering database containing layered tables of rule tables, the method comprising the steps of:

- selecting a protocol element from the input data;
- accessing a rule table in said layered tables of rule tables corresponding to the selected protocol element; said rule table comprising at least one filtering rule; and
- applying the at least one filtering rule to the selected protocol element.

56. The method of claim 55 wherein the step of selecting a protocol element further comprises the substeps of:

- obtaining a protocol element locator from the rule table in the filtering database; and
- applying the protocol element locator to the packet to select the protocol element from the packet.

57. The method of claim 55 wherein the step of applying the at least one filtering rule comprises the substep of:

- determining whether the selected protocol element is less than or equal to an upper bound.

1 58. The method of claim 55 wherein the step of applying the at least one filtering rule  
 2 comprises the substep of:  
 3 determining whether the selected protocol element is greater than or equal to a lower  
 4 bound.

1 59. The method of claim 55 further comprising the step of receiving a packet prototype for  
 2 modifying the filtering database.

1 60. A system for filtering packets in parallel comprising:  
 2 a packet data interface, for receiving a packet; and  
 3 a parallel filtering database coupled to the packet data interface, the parallel filtering  
 4 database comprising a parallel filtering database entry.

1 61. The system in claim 60 wherein the filtering database further comprises:  
 2 at least one Table ID Content Addressable Memory (CAM);  
 3 a Filtering rule storage; and  
 4 an Associated Data.

1 62. The system in claim 60 wherein the system is coupled to receive a packet prototype for  
 2 modifying the parallel filtering database.

1 63. A system for modifying a filtering database comprising:  
 2 a packet prototype for determining a location to be modified in the filtering database, and  
 3 a filtering engine for receiving the packet prototype and for modifying the location  
 4 determined by the packet prototype.

64. The system of claim 63 wherein the packet prototype comprises:

at least one protocol element descriptor having an upper bound and a lower bound,

wherein said lower bound and said upper bound are used to point to a location in the filtering

database.

65. The system of claim 63 wherein the packet prototype is received from an external

software source.

66. A method for modifying a filtering database, the method comprising the steps of :

receiving a packet prototype, said packet prototype comprising an upper bound and a

lower bound;

using the packet prototype to determine a specific location in the filtering database; and

modifying the specific location in the filtering database.

67. The method of claim 66 wherein the packet prototype further comprises an offset and a

mask.

68. The method of claim 66 wherein the specific location in the filtering database is a

filtering rule.

69. The method of claim 66 wherein the specific location in the filtering database is a rule

table.

70. The method of claim 66 wherein the step of modifying the specific location in the

filtering database comprises adding or deleting a filtering rule.

- 1 71. The method of claim 66 wherein the step of modifying the specific location in the
- 2 filtering database comprises adding or deleting a rule table.

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